Nothing Succeeds Like Succession (adapted from Project Learning Tree)

Curriculum Standards:

5-2.2 Summarize the composition of an ecosystem, considering both biotic factors and abiotic factors.
5-2.3 Compare characteristics of different ecosystems (ponds, forests and grasslands)
5-2.4 Identify the roles of organisms as they interact and depend on one another through food chains and food webs in an ecosystem, considering producers and consumers, decomposers, predators, prey, and parasites and hosts.
5-2.5 Explain how limiting factors affect populations in ecosystems.

Overview: ***Succession*** is a natural pattern of change that takes place over time in a forest or an ecosystem. In this activity, students will study the connection between, plants, animals, and successional stages in refuge ecosystems. *Time:* 120 minutes total

10 minutes – Introduction of refuge and the program; divide large group into two groups (classes)

30 minutes –

Group 1: The students will hear a story about succession. Students will be divided into smaller groups. Overlays depicting different stages of succession will be handed out. Small groups will sequence overlays to show succession and report to the entire group upon completion. Students will record results in their science journal.

Group 2: Students will be led on a nature walk around the Lake Bee Area and shown several types of vegetative communities. Students will identify plant communities in different stages of succession. Students will look for animals or signs and sounds of animals. Students will look for evidence of disturbance that might alter natural succession. Students will record information in their science journal.

5 minutes: groups switch and then repeat previous activities for 30 minutes

15 minutes – Bring both groups together and define stages of succession evident at the study site. Discuss factors that alter succession including disease, insects, fire, wind, lightening, pollution, erosion, and drought.

30 minutes – Divide groups into teams of three. Have each group draw a general map of the study area, including major landmarks and then identify and draw areas that fall into the different categories of succession identified throughout the field trip. Students will record information in their science journal.

Teacher Information

The activity will take place at the Lake Bee Recreation Area of the Carolina Sandhills National Wildlife Refuge located on Highway 145 between the towns of McBee and Chesterfield in Chesterfield County. All roads leading to this area are paved and bus parking is available at the site. The site includes covered picnic shelters, picnic tables, rest-room facilities, and trash receptacles. A minimum of two refuge staff (or trained volunteers) will lead the planned activities. All materials and tools, if applicable, will be provided. Teachers will need to copy and distribute journal pages to students prior to the field trip.

Background

Succession is the orderly replacement of plant and animal species through time in a given location, leading to a relatively stable ***biotic*** community. In a landscape, that lacks both vegetation and soil (such as a sand dune or a recently cooled lava flow), ***primary succession*** may begin. In primary succession on land, living organisms slowly, often over hundreds or thousands of years, build soil. The first plants to arrive, sometimes called ***pioneer*** species, are usually fungi, lichens or mosses, and ferns, which are the oldest types of land plants. Over time, rock is weathered to soil; mosses and ferns cover the landscape; and small seeds, carried by animals or blown by wind, take root. Small shrubs and plants become established. Eventually, if conditions are right, a healthy ***plant community*** with mature trees and plants will grow.

The Sandhills region is the physiographic region that lies between the Coastal Plain and Piedmont Plateau. Geologists believe that the sandhills were formed from deposits eroded from the Appalachian Mountains. Heavier materials were deposited first (as evidenced by the heavy, clay soils of the Piedmont) and the lighter, sandier material was carried farther downstream and formed the sandhills.

Secondary succession occurs on landscapes previously occupied by vegetation and can be considered an extension of primary succession (the soil building phase). Grass may begin to grow, followed by herbaceous and small woody plants, followed by shrubs and trees.

In some cases, whole regions are undergoing succession: For example, in the eastern United States, most of the trees were once cut down for timber and cleared for agriculture. When the fields were left unfarmed (fallow), native plants slowly began to recolonize the old fields. Today, completely new forests stand where the original ones used to be. This area (Chesterfield County) was settled by farmers who tried to farm the nutrient-deficient soils (sand). During the Great Depression, the federal government bought the land from willing sellers and established a national wildlife refuge on the highly eroded and disturbed land. Refuge staff planted pine trees, created ponds along the drainages, and disturbed (applied fire, mowed, or disked) wildlife openings to keep them in early successional stage (grasses) for the benefit of wildlife. Over the years, additional techniques were used to manage the fields and forests, creating a mosaic of habitats throughout the refuge.

Each successional stage is accompanied by its characteristic animal species. ***Early-successional*** animal species find food and shelter among the weedy pioneer plants that invade areas cleared by natural or human causes. ***Mid-successional*** species are found in partially open areas. Openings in the forest canopy promote the growth of plants that are favored as food by many mammals and birds.

These openings provide edge habitat where field and forest meet, allowing animals to feed on the vegetation in the opening and to escape quickly into the forest. ***Late-successional*** animal species require mature forest habitats to provide the food and cover they need. Many species thrive in other types of mature plant communities such as grasslands, tundra, or deserts.

A mature forest is not always the stable climax to succession. For example, because the redwoods of California live to be hundreds of years old, ecologists traditionally believed that they were a climax species. However, ecologists now believe that redwood forests that do not undergo periodic ***disturbance***s, such as fire or windstorm, will eventually give way to a forest of hemlocks, which thrive in the shade of the redwoods. However, if the hemlock forest burns, it will grow back as a redwood forest, since redwoods have thick bark and are fire resistant.

Sometimes, people purposely hold back succession to allow one stage to dominate, as when a farmer continually harvests and plows a field. Abandoned lots and neglected lawns, as well as parks, all show signs of secondary succession. When human caused "setbacks" such as mowing or plowing are discontinued, new species of vegetation appear or begin to dominate the landscape. What we call weeds, are the first stage of secondary succession.

Career Connections:

Students will interact with wildlife biologists and foresters and will learn what people in these careers do at their jobs. Leaders will discuss core subjects and educational requirements and recommend opportunities for further study and experience in the field.

Resources:

Refuge website -- http://www.fws.gov/carolinasandhills/

Project Learning Tree website -- http://www.plt.org/

Careers in Wildlife -- http://www.wildlife-international.org/EN/public/kids/jobs.html

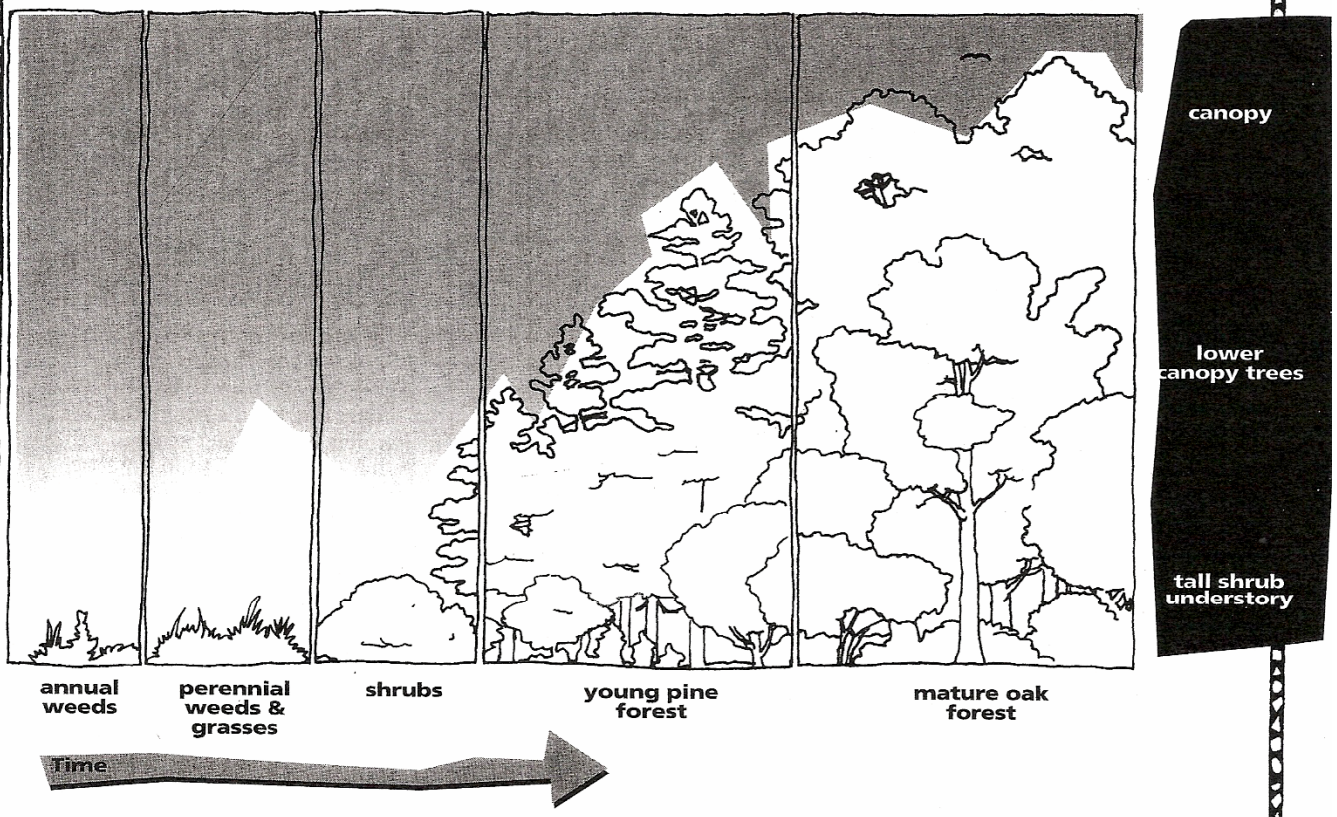
5th grade Curriculum Standards -- http://www.sceoc.com/06-07%20Standards/Grade%2005.pdf

Page 310, Project Learning Tree – Picture of Succession (refuge will provide copies)

Page 309, Project Learning Tree – Tree Tops Valley "Story of Succession" (refuge leaders will read to students)

STUDENT PAGE©

PICTURE OF SUCCESSION



STUDENT PAGE©

TREE TOPS VALLEY

Once upon a time, a boy and a girl lived with their parents at the edge of a beautiful green valley in the Pacific Northwest. Their names were Sara and John.

The valley was filled with a vast evergreen forest. Its trees towered over the log cabin where John and Sara lived. Sara and John loved the forest. Every day they went exploring. They paddled in the forest's cool streams and made trails under the giant conifers.

They also liked to have picnics at the top of a hill near their home. Up there, they could look down on the tops of the valley's huge trees.

One day when they were up on the hill, they decided to give the valley a name. They called it Tree Tops Valley.

Then, in the middle of a hot summer day, everything changed. A lightning storm started a fire in the forest. Luckily, the wind blew the flames away from Sara and John's home. But when the fire went out, they saw it had burned their Tree Tops Valley. All the tall trees were burned. The tender little seedlings that had grown on the forest floor were gone. All that was left was the burned remains of trees.

They both wanted to cry. Sara said, "I just can't look at it. Our beautiful forest is gone forever. I never want to sit on our hill again." After the fire, the family moved away to a settlement where other families lived. There were children there, and Sara and John made new friends.

Then, five years after the fire, their father said, "Why don't we visit the valley? It would be good to see it again."

Sara and John didn't want to go. They remembered how the valley had looked after the fire. But they agreed, and one day, the family saddled their horses and rode up to the valley.

What a surprise! Things had happened since the fire. Winds had blown seeds into the valley. Birds had dropped them from the air. The seeds had sprouted. Now, instead of bare, burned ground, there were mosses, weeds, grasses, and ferns growing everywhere. The children rode back home feeling much better about Tree Tops Valley.

The years went by. Before they knew it, Sara and John had grown up. The settlement where they lived was much bigger now. John became a teacher and taught at the one room school that the settlers had built.

Sara decided to be a prospector. She had heard stories about people who were finding gold farther north. So Sara bought supplies and one day was ready to leave. She promised John she would write him.

John didn't hear from Sara for many months. Then, finally, a letter arrived. In the letter, Sara wrote, "On my way north, I passed through Tree Tops Valley. You would be amazed at how the valley looks now! Our old cabin is still there, but everything else has changed. The whole valley is full of berry bushes. I had a feast!"

The letter gave John an idea. He thought, "When I have children of my own, I'll take them berry picking in the valley. That would be fun!"

Soon after that, John got married. When his oldest son was 10 years old, he remembered his idea. He took his family to the valley to pick berries. His children loved the valley. But there were no berries to pick. Most of the bushes were gone.

Instead, the valley was filling with deciduous trees. John wrote to Sara about them. He wrote, "There are lots of leafy green trees in the valley. And I saw some conifer seedlings. The leafy trees have shaded the berry bushes and choked them out. I don't know what the trees are called, but they have made the valley all green again."

Many years passed. John's children grew up and had families of their own. One summer, when John was 75 years old, he received a letter from Sara. It read:

Dear John,

Remember how we loved Tree Tops Valley when we were young? Last month I decided to visit it again, before I got too old to make the trip. It was a long ride, but I made it! You would be happy to see our valley now. It's beautiful!

Remember those leafy green trees you saw on your last trip there? Well, most of them are gone. Now the valley is full of young coniferous trees. Who knows? Maybe our grandchildren will see the valley looking the way we once saw it.

Love,

Sara

The years went by. It was now 100 years since the fire had swept through Tree Tops Valley.

One day, John's granddaughter, Jennifer, was looking at some old family letters. She found the letter Sara had written to John after her last visit to Tree Tops Valley.

"Look at this," Jennifer said to her husband. "It's a letter that belonged to my grandfather John. His sister wrote it to him. It's all about a place called Tree Tops Valley. I wonder if we could find the valley. Why don't we try?"

And that's what they did. Jennifer and her husband found the valley. They even found the hill where Sara and John had taken their picnics.

From the hill, they could see tall conifers filling the whole valley. They climbed down and explored. Jennifer and her husband didn't know it, but Tree Tops Valley was well into the long journey of rebuilding the same kind of forest that Sara and John had enjoyed so many years before.

Classroom Enrichment – Nothing Succeeds Like Succession

1. The orderly replacement of plant and animal species through time in a given location leading to a relatively stable biotic community is:

a. disturbance b. succession c. ecosystem d. management

2. The type of community of, relating to, or caused by nonliving organisms, such as sunlight, moisture, temperature, and wind is:

e. abiotic f. tundra g. biotic h. habitat

3. The type of community of, relating to, or caused by living organisms, such as plants and animals is:

a. abiotic b. forest c. biotic d. habitat

4. A community of plants and animals interacting with one another and chemical and physical factors of the nonliving environment is:

e. habitat f. ecosystem g. forest h. succession

5. The type of succession that is characterized by the development of soils and occurs slowly when rock or lava is first exposed to biotic processes is:

a. primary b. secondary c. disturbance d. ecological

6. The type of succession that is characterized by the development of a community of plants into an area that had previously been occupied by plants following some type of disturbance in which the soils remain is:

e. primary f. secondary g. disturbance h. ecological

7. The first stage of plant community development, characterized by grasses and weeds is:

a. pioneer b. late successional c. mid successional d. early successional

8. The second stage of plant community development, characterized by mainly open area with some shrubs and small trees is:

e. disturbance f. late successional g. mid successional h. early successional

9. The final stage of plant community development, characterized by mature trees and shrubs and a mainly closed canopy is:

a. habitat b. late successional c. mid successional d. early successional

10. A natural event or management action that holds back the development of plant communities is:

e. ecology f. succession g. ecosystem h. disturbance

Bonus: A scientist who studies natural processes and the interrelationship of organisms in their environment is:

a. forester b. biologist c. meteorologist d. ecologist